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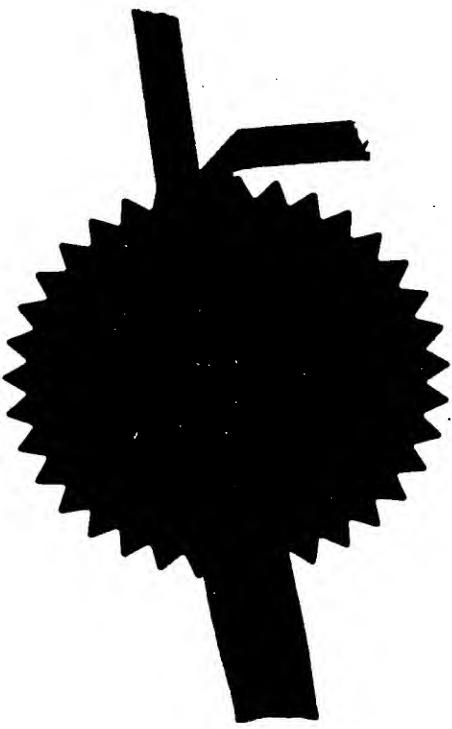
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Please type, or write in dark ink using CAPITAL letters. A prescribed fee is payable for a request for grant of a patent. For details, please contact the Patent Office (telephone 0171-438 4700).

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(*) Do not give trading styles, for example, 'Trading as XYZ company', nationality or former names, for example, 'formerly (known as) ABC Ltd' as these are not required.

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The
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Request for grant of a Patent

Form 1/77

Patents Act 1977

① Title of invention

1 Please give the title of the invention Strand Material

② Applicant's details

First or only applicant

2a If you are applying as a corporate body please give:

Corporate name Coats Viyella plc
 28 Savile Row
 London

Country (and State of incorporation, if appropriate) Great Britain

2b If you are applying as an individual or one of a partnership please give in full:

Surname

Forenames

2c In all cases, please give the following details:

Address 28 Savile Row
 London

UK postcode
(if applicable) W1X 2DD

Country Great Britain

ADP number
(if known)

6790026001

2d, 2e and 2f: If there are further applicants please provide details on a separate sheet of paper.

Second applicant (if any).

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① An address for service in the United Kingdom must be supplied

Please mark correct box

② Address for service details

- 3a Have you appointed an agent to deal with your application?

Yes No **go to 3b**

please give details below

Agent's name McNeight & Lawrence

Agent's address Regent House
 Heaton Lane
 Stockport
 Cheshire

Postcode SK4 1BS

Agent's ADP
number 0001115001 ✓

3b: If you have appointed an agent, all correspondence concerning your application will be sent to the agent's United Kingdom address.

Name

Address

Postcode Daytime telephone
 number (if available)

ADP number
(if known)

① Reference number

- 4 Agent's or
applicant's reference
number (if applicable)

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② Claiming an earlier application date

- 5 Are you claiming that this application be treated as having been filed on the date of filing of an earlier application?

*Please mark correct box*Yes No **go to 6***please give details below*

- number of earlier
application or patent
number

- filing date

(day month year)

- and the Section of the Patents Act 1977 under which you are claiming:

15(4) (Divisional) 8(3) 12(6) 37(4) **③ Declaration of priority**

- 6 If you are declaring priority from previous application(s), please give:

Country of filing	Priority application number (if known)	Filing date (day, month, year)
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① If you are declaring priority from a PCT Application please enter 'PCT' as the country and enter the country code (for example, GB) as part of the application number.

Please give the date in all number format, for example, 31/05/90 for 31 May 1990.

① The answer must be 'No' if:

- any applicant is not an inventor
- there is an inventor who is not an applicant, or
- any applicant is a corporate body.

② Please supply duplicates of claim(s), abstract, description and drawing(s).

② Inventorship

7 Are you (the applicant or applicants) the sole inventor or the joint inventors?

Please mark correct box

Yes No A Statement of Inventorship on Patents Form 7/77 will need to be filed (see Rule 15).

③ Checklist

8a Please fill in the number of sheets for each of the following types of document contained in this application.

Continuation sheets for this Patents Form 1/77

Claim(s)

Description 9

Abstract

Drawing(s) 2

8b Which of the following documents also accompanies the application?

Priority documents (please state how many)

Translation(s) of Priority documents (please state how many)

Patents Form 7/77 - Statement of Inventorship and Right to Grant (please state how many)

Patents Form 9/77 - Preliminary Examination/Search

Patents Form 10/77 - Request for Substantive Examination

Please mark correct box(es)

④ You or your appointed agent (see Rule 90 of the Patents Rules 1990) must sign this request.

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Date 09 06 95
(day month year)

McNeight & Lawrence

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STRAND MATERIAL

This invention relates to strand material and to methods and apparatus for making it.

In WO95/06558 is disclosed a method for making strand material comprising drawing a laminar material having a first layer of drawable material and a second layer of elastically extensible material so that the first layer extends inelastically while the second layer extends elastically so that the drawn material tends to curl into a coiled strand configuration. Strands suitable for use as weaving, knitting and sewing threads may be made from e.g. a nylon or polyester tape coated with a polyurethane elastomer. A tape having a width of some 5mm with a pre-draw thickness of 12-14 microns, of which 2 microns will be the elastic layer, will draw down and curl into a filament - like form which is suitable for textile purposes.

The tendency to curl and remain curled is ascribed to a change in the relative widths of the substrate and elastic material after drawing, the elastic material having been reduced in width less than the substrate and so tending to an equilibrium position in which it lies on the outside of the curled formation.

WO 95/06558 describes two modes of coiling, namely a single spiral, in cross-section, and a "C" formation with each end of the "C" in the form of a tight spiral - this may be symmetric or asymmetric, with one coil being larger than the other.

The fact of the elastic coating layer being on the outside of the coil structure imposes some limitations on the choice of materials and also some limitations on the use to which the strand material may be put. It is desirable that, for regular textile usage, the strand - and thus the outer elastic material - have good abrasion resistance, be non-abrasive and be readily lubricated.

The outer layer is also thin and even though it may have good abrasion resistance, it is, on account of its thinness and its exposure, liable to being rubbed off together, of course, with any colour it carries.

The present invention provides novel strand material that does not suffer from these disadvantages, and which has other advantages over prior art strand materials, and also provides methods and apparatus for making such strand material.

The invention comprises strand material comprising a coiled tape having in cross-section an inner spiral of one hand, a diametral bar, and an outer spiral of opposite hand.

The material may be of bicomponent tape comprising a substrate and a coating; the coating may be of an elastic material, which may be an elastomer.

In this form of structure, the substrate, which may be a polymer such as nylon 6, nylon 6,6 or polyester, may be on the outside of the outer spiral. Since the substrate is of a conventional textile polymer, it can be treated, e.g. dyed, in the ordinary way and will have the like properties in important respects as conventional textile fibres

or filaments.

As disclosed in WO 95/06558, the strand material may comprise additional spun filament material, which may be contained within the cross-section of the coiled tape.

Such strand material, while being suitable for many end uses, can, in particular, be adapted for use as a weaving, knitting or sewing thread. Such adaption may take the form of dyeing, lubricating, twisting, plying, texturising, sizing and the like, and, of course, specifying the material to have any desired linear density. It is in addition capable of incorporating liquids or powders within its coiled structure, all as described in WO95/06558.

The invention also comprises a method for making strand material in which a flat tape of drawable material is drawn and twisted to form a coiled tape.

The tape may be twisted in a draw zone, and may be false twisted.

False twisting may be effected by a friction false twist device, which may comprise a roller over which the tape runs with a non-trivial angle between the direction of travel of the tape and the direction of travel of the roller surface where the tape contacts it. The run of the tape may turn the roller, or the roller may be driven.

The effect of the twisting can be to produce the reversing spiral formation above-mentioned, though a monospiral and other configurations can also be produced.

The twisting initiates the coiling, though the width differential of a composite tape with an elastically extensible layer as aforementioned may operate to maintain the spiral formation against an tendency to relax over time. Because the width differential is no longer needed to initiate the coiling, it is possible to hot-draw the tape. Among other advantages, the hot draw zone input roller can be used to dry a just-coated tape - the tape can be run elastomer side down on the hot roller.

As with WO95/06558, the composite tape may be drawn to stabilise the drawable polymer within the elastic limit of the elastic material. The drawable polymer may have a natural draw ratio which is the smallest draw ratio at which it is stabilized but may be one that can be drawn substantially beyond its normal draw ratio, and doing this brings advantages in terms of strength and increased fineness.

The invention also comprises apparatus for processing a tape of a drawable polymer material comprising an arrangement for the supply of the tape, a drawing arrangement for the tape and a twisting arrangement for the tape.

The supply arrangement may comprise a support for a roll of tape.

The drawing arrangement may comprise input and output roller means.

The twisting arrangement may comprise a false twisting arrangement, which may be located in the drawing arrangement so that false twist runs back to a twist stop therein which may be situated at input roller means thereof.

The false twisting arrangement may comprise a friction false twisting arrangement, which may comprise a roller, which may be a flanged roller, over which the tape is guided to run with a non-trivial angle between the direction of travel of the tape and the direction of travel of the roller surface where the tape contacts it. The term "friction false twist device" is intended to encompass devices where there is relative sliding between the contacting surfaces as well as devices where the tape has a purely rolling motion over the roller surface. The roller may be free to be rotated by the tape as it runs over it, or it may be driven, which might give rise to a wider degree of control over the coiling operation.

Strand materials and methods and embodiments of apparatus for making them (and other strand materials) according to the invention will now be described with reference to the accompanying drawings, in which :

Figure 1 is a cross-section of a first strand material,

Figure 2 is a cross-section of a second strand material,

Figure 3 is a cross-section of a third strand material,

Figure 4 is a cross-section of a further strand material,

Figure 5 is a diagrammatic illustration of apparatus for strand material production.

Figures 1 to 4 illustrate strand materials that can be made using the apparatus illustrated in Figure 5 and the methods for using the same described herein.

Figure 1 illustrates a strand material 11 similar to one that can be produced according to WO95/06588, but which can be produced more readily and with improved properties as compared to prior art materials including those of WO95/06558. The material 11 in cross-section comprises a monospiral of a two component film material of which one component 12 is a substrate of a drawn film-forming synthetic polymer material and the other component 13 is a coating of an elastomer such as polyurethane.

The material is tightly coiled, with the elastomer 13 on the outside. The cross-section is greatly enlarged - the tape material from which it is produced is a few, say 5, millimetres wide, while the finished strand has a linear density of perhaps 200 decitex.

The strand material 21 of Figure 2 has a "C" shaped cross-section with strong tight spirals at the ends of the "C". Again, it is of a composite film material having a drawn polymer substrate 12 with an elastomer coating 13 thereon.

The material 31 of Figure 3 is like that of Figure 1 except for having additional spun filaments 32 contained within the spiral formation.

All of these materials, which resemble materials described in WO95/06558, can be produced by the methods and apparatus which will be described with reference to Figure 5.

The strand material 41 illustrated in Figure 4, however, is new and illustrates an increased flexibility of production that is achievable using the novel methods and apparatus described herein.

The material 41 is, as before, of a drawn polymer film substrate 12 with an elastic coating 13, but has in cross section an inner spiral 42 of which the elastic coating 13 is on the outside, and then a reversal, producing a diametral bar 43 and an outer spiral 44 of opposite hand to the inner spiral 42. Thus the substrate 12, which can be of polymer such as nylon 6m nylon 6.6 or polyester with good textile properties such as dyeability and abrasion resistance, appears now on the outer surface of the strand material.

WO95/06558 discusses incorporating fillers into the components of the strand material, the fillers comprising solid particulate material such as TiO₂ or gas or liquid inclusions which can modify the properties of the material. The same fillers, can, of course, be included in the materials described herein. Thus TiO₂ can be included as optical brightener, or zinc oxide could be included, giving brighter colours in colouring than TiO₂. The strand material can have a shiny or a matt appearance, however, depending upon whether the elastic or the substrate layer is on the surface. A strand can, however, be produced which has no included material and which is translucent - such a strand, undyed, can be used as a sewing thread in coloured fabric where it will transmit the colour of the fabric - this will avoid the need to produce sewing threads of many different colours, although it might be preferred to produce threads in just a few colours which might more readily blend in with a similar but not exactly matching fabric.

Figure 5 illustrates the method and apparatus for producing threads as described with reference to Figures 1 to 4.

The apparatus comprises an arrangement 51 for the supply of a tape 52 - in fact, this Figure illustrates alternative such supplies A and B. Supply A is simply a support 53 for a roll 54 of bicomponent tape 52. Supply B is a coating arrangement in which a nylon, polyester or like film material substrate 52b is supplied from a roll 54b to a coating arrangement 55 at which an aqueous suspension of a polyurethane, for example, is applied by a roller 56 from a bath 57 to form a bicomponent tape 52.

The tape 52 is supplied, elastic coating side up, a hot godet 58 to dry the coating, then, coating side down, to an input feed roller arrangement 59 of a drawing arrangement which includes also an output roller arrangement 60 running at a higher surface speed than the arrangement 59. The input arrangement 59 is heated.

Between the input and output roller arrangements the tape passes over a flanged, free-running roller 61 arranged at such an angle that the tape receives a false twist that runs back to the input roller arrangement 58. The tape may need to be pre-twisted by hand at start-up before being applied on to the roller 61. The coiled tape strand material 62 is wound up in a take-up arrangement 63, which comprises a godet 64 which together with the output godet 60 may be hot or cold, a lubrication applicator 65 and a wind-up bobbin 66.

The roller 61 could of course, be driven in rotation.

The idea is that the coiled up tape 52 rolls on or is perhaps slidingly rotated by contact with the roller 61 so that a false twist is generated. Depending on the position and skewedness of the roller 61 in relation to the path of the strand between the input and output roller arrangements, one or other of the strands illustrated in Figures 1 to 4 will be produced. The strand of Figure 2 would normally be produced without the use of the roller 61 or with it set square-on rather than skewed. The addition of a drive for the roller 61 instead of allowing it to rotate under the drag of the running strand may give better control to the extent that the disposition of the diametral bar 43 in relation to the inner and outer spirals of the strand material 41 of Figure 4 could be predetermined with accuracy.

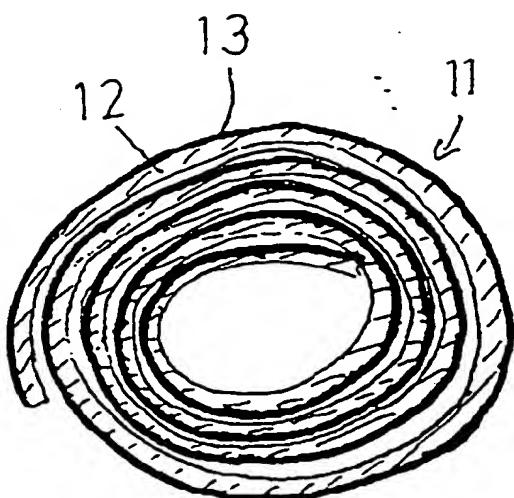


Fig 1

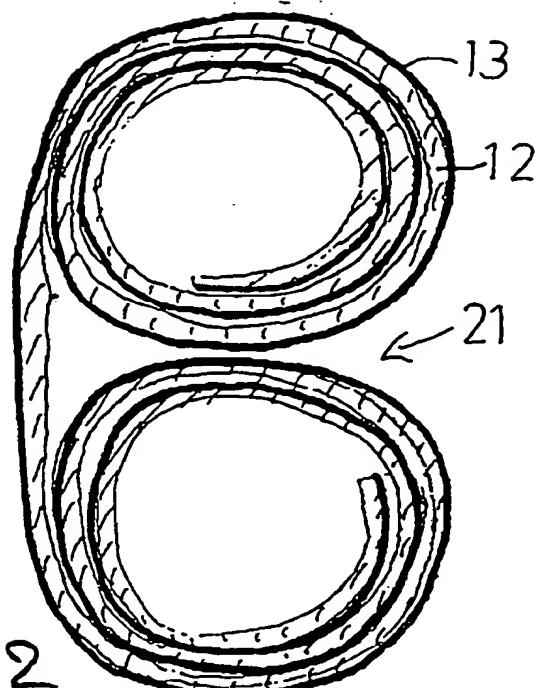


Fig 2

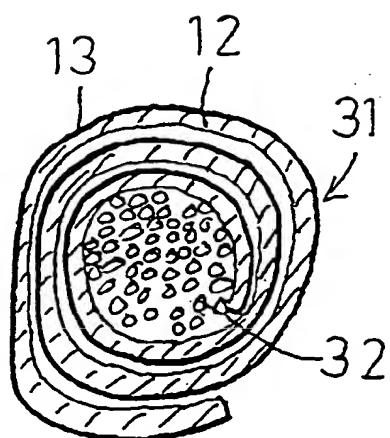


Fig. 3

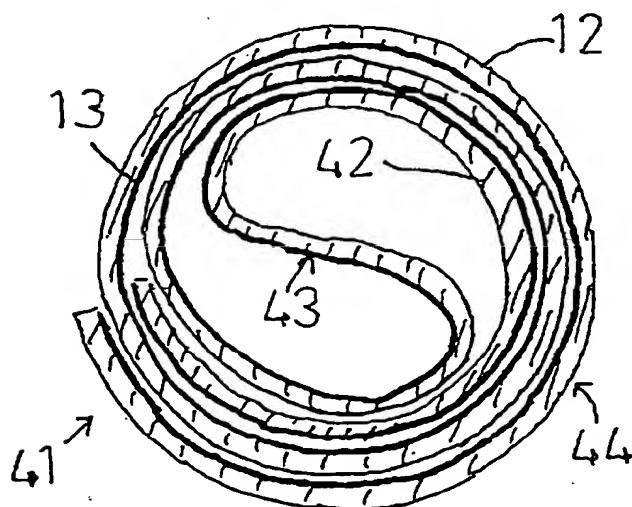


Fig 4

